



293

II

Total No. of Questions : 24

Total No. of Printed Pages : 3

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## Part - III

## MATHEMATICS - PAPER - II (B)

(English Version)

Time : 3 Hours

Max. Marks : 75

**Note :** This question paper consists of three sections A, B and C.

## SECTION - A



## I. Very short answer type questions :

10x2=20

(i) Attempt *all* questions.(ii) Each question carries *two marks*.

1. Find the equation of the circle whose end points of a diameter are (4, 2), (1, 5).

2. If the length of the tangent from (2, 5) to the circle  $x^2 + y^2 - 5x + 4y + k = 0$  is  $\sqrt{37}$  then find k.3. Find k if the pairs of circles  $x^2 + y^2 + 4x + 8 = 0$ ,  $x^2 + y^2 - 16y + k = 0$  are orthogonal.4. Find the coordinates of the points on the parabola  $y^2 = 8x$  whose focal distance is 10.5. If the angle between the asymptotes is  $30^\circ$  then find its eccentricity of hyperbola.6. Evaluate :  $\int \sec^2 x \cosec^2 x \, dx$ 7. Evaluate :  $\int e^{\log(1+\tan^2 x)} \, dx$ .8. Find the value of  $\int_0^{\frac{\pi}{2}} \cos^7 x \sin^2 x \, dx$ .

[ 1 of 3 ]

293



9. Find the area of the region enclosed by the given curves  $x=4-y^2$ ,  $x=0$ .



10. Find the order and degree of the differential equation  $\left[ \frac{d^2y}{dx^2} + \left( \frac{dy}{dx} \right)^3 \right]^{\frac{6}{5}} = 6y$ .

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### SECTION - B

II. Short answer type questions :

5x4=20

(i) Attempt *any five* questions.

(ii) Each question carries *four* marks.

11. Find the length of the chord intercepted by the circle  $x^2+y^2-x+3y-22=0$  on the line  $y=x-3$ .



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12. Show that the circles  $x^2+y^2-8x-2y+8=0$  and  $x^2+y^2-2x+6y+6=0$  touch each other and find the point of contact.

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13. Find the equation of the tangent and normal to the ellipse  $9x^2+16y^2=144$  at the end of the latus rectum in the first quadrant.

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14. If  $P(x, y)$  is any point on the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  ( $a > b$ ) whose foci are  $S$  and  $S'$  then prove that  $SP+S'P$  is a constant.

15. Find the centre, foci, eccentricity, equation of the directrices, length of the latus rectum of the hyperbola.

$$x^2 - 4y^2 = 4.$$

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16. Evaluate :  $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$ .

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17. Solve :  $\frac{dy}{dx} + \frac{3x^2}{1+x^3} y = \frac{1+x^2}{1+x^3}$ .





### SECTION - C

**III.** Long answer type questions :



**5x7=35**

(i) Attempt *any five* questions.



(ii) Each question carries *seven marks*.



**18.** If  $(2, 0)$ ,  $(0, 1)$ ,  $(4, 5)$  and  $(0, c)$  are concyclic then find  $c$ .



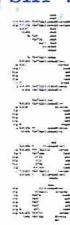
**19.** Find the transverse common tangents of the circles  $x^2 + y^2 - 4x - 10y + 28 = 0$  and  $x^2 + y^2 + 4x - 6y + 4 = 0$ .

**20.** Define parabola and obtain the standard form of the parabola  $y^2 = 4ax$ , ( $a > 0$ ).

**21.** Obtain the reduction formula for  $\int \sin^n x \, dx$  for an integer  $n \geq 2$  and deduce  $\int \sin^4 x \, dx$ .



**22.** Evaluate :  $\int \frac{x+1}{x^2+3x+12} \, dx$ .



**23.** Evaluate :  $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{9+16\sin 2x} \, dx$ .



**24.** Solve :  $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right)dy = 0$ .

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[ 3 of 3 ]

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